

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : G11B 20/04	A1	(11) International Publication Number: WO 00/55853 (43) International Publication Date: 21 September 2000 (21.09.00)
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(21) International Application Number: PCT/KR00/00202 (22) International Filing Date: 13 March 2000 (13.03.00) (30) Priority Data: 1999/8500 13 March 1999 (13.03.99) KR (71)(72) Applicants and Inventors: KIM, Byung-Soo [KR/KR]; 21/5, 237-17, Chunho-1dong, Kangdong-ku, Seoul 134-021 (KR). PARK, Huong-Su [KR/KR]; 1710-702, Okbitnaeui, 1135, Hwajung-dong, Duceyang-ku, Kyungki-do 412-270 (KR). (72) Inventor; and (75) Inventor/Applicant (for US only): LEE, Yong-Sup [KR/KR]; 7-11, Jukongsibum A.P.T., 1091, Hwagok-3dong, Kangsu-ku, Seoul 157-013 (KR). (74) Agents: LEE, Chul et al.; 2F, Changsang Building, 1543-12, Seocho-3dong, Seocho-ku, Seoul 137-073 (KR).	(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SB), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
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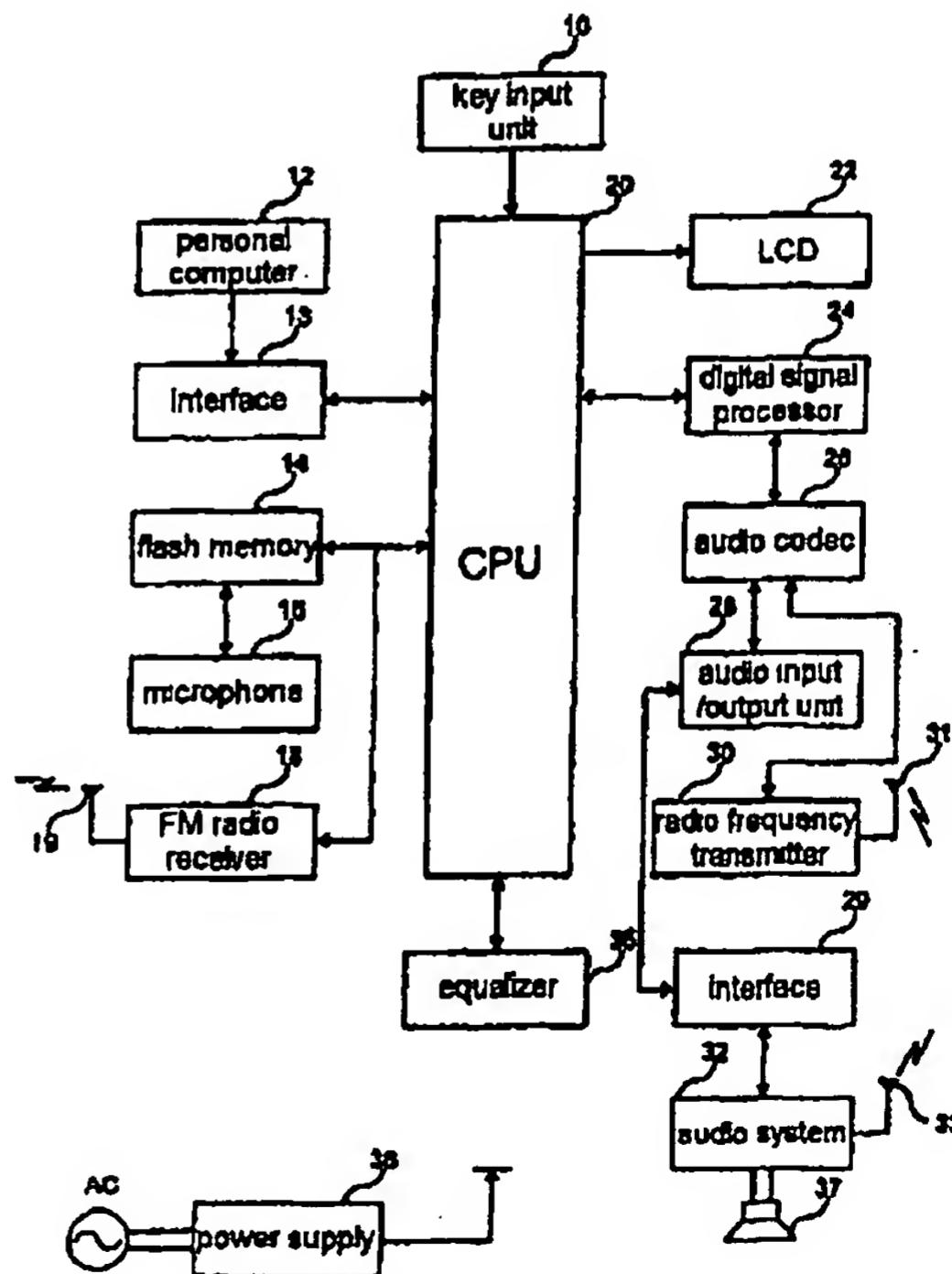
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Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: PORTABLE DATA STORAGE/AUDIO REPRODUCTION APPARATUS

(57) Abstract

A portable data storage/audio reproduction apparatus comprising a power supply (36) for supplying operating power to the reproduction apparatus, a key input unit (10) for inputting a plurality of key signals, a personal computer (12) for downloading and storing audio data and various information data through Internet or PC communication, a flash memory (14) for storing the audio data and various information data from the personal computer (12), a microphone (16) for converting external input voice or sound into an electrical signal, an FM radio receiver (18) for receiving a desired band of FM radio signals, a CPU (20) for generating a plurality of control signals, an LCD (22) for providing a visual indication of output data from the CPU (20), a digital signal processor (24) for processing input/output digital signals to/from the CPU (20), an audio codec (26) for performing audio coding/decoding operations, an audio input/output unit (28) for receiving an external analog audio signal, transferring it to the audio codec (26), receiving an analog audio signal from the audio codec and outputting it externally, a radio frequency transmitter (30) for modulating the analog audio signal from the audio codec into a radio frequency signal to remotely transmit it, and an equalizer (35) for compensating for a distortion of output audio data from the reproduction apparatus.



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PORABLE DATA STORAGE/AUDIO REPRODUCTION APPARATUS

Technical Field

5 The present invention relates in general to a portable data storage/audio reproduction apparatus, and more particularly to a portable data storage/audio reproduction apparatus which is capable of downloading audio data from a personal computer or audio equipment and storing the downloaded audio data in its memory chip to allow the user to listen to sound of the stored audio data while
10 carrying the reproduction apparatus, and of downloading various information data from the personal computer other than the audio data and storing the downloaded information data in its memory chip or in other personal computers or data storage means.

15 Background Art

Generally, an audio system such as a cassette tape recorder, compact disk player or laser disk player is used to record an audio signal of voice or sound and/or reproduce the recorded audio signal. Such an audio system can
20 record and/or reproduce an audio signal of voice or sound on/from a recording medium such as a magnetic tape or magneto-optic disk.

In the case where a magnetic tape is used as the above recording medium, it is desirable to repeat the recording and reproduction of an audio

signal, but has a disadvantage in that it cannot be semi-permanently used under an unfavorable condition such as heat or moisture because of its properties. Further, the magnetic tape is liable to be deteriorated due to friction with either an erasing head or recording head installed in the audio system while recording or reproducing the audio signal. Such deterioration of the magnetic tape degrades the quality of sound, thereby making it impossible to use the magnetic tape for a lengthy period of time.

In the case where a compact disk is used as the above recording medium, it is desirable to semi-permanently reproduce an audio signal recorded thereon, but has a disadvantage in that there is additionally required equipment capable of recording the audio signal on the compact disk. Further, such equipment is scarcely applied to the audio system because it is high in cost.

Furthermore, it is not easy to record a data signal from a personal computer other than the audio signal of voice or sound on the above recording medium and copy or store the recorded data signal to other personal computers or storage media.

In other words, an audio system such as a cassette tape recorder, which utilizes a magnetic tape as a recording medium, can record, reproduce and erase audio data on the magnetic tape, but it cannot rapidly select a tune desired by the user due to a mechanical deterioration of the magnetic tape or rewinding or fast forward winding of the magnetic tape. Further, a compact disk is unable to record audio data thereon without using separate equipment and is disadvantageous in cost. Moreover, the user has the trouble of replacing the

current magnetic tape or compact disk with one containing a desired one of tunes of different music genres, singers or groups to listen to the desired tune.

Further, either the magnetic tape or compact disk as the recording medium is connected to an output device only by wire, thereby making it impossible for the user to remotely listen to music from the tape or disk. Furthermore, it is not easy to record special information data other than the audio data on the magnetic tape or compact disk.

Disclosure of the Invention

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Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a portable data storage/audio reproduction apparatus which is capable of downloading compressed audio data through Internet or PC communication according to a program running in a personal computer or downloading compressed audio data, stored in an audio data storage medium such as a memory chip using a compression technique by an audio storage device, and storing and outputting the downloaded audio data to allow the user to listen to music of the audio data or voice thereof for language study while carrying the reproduction apparatus.

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It is another object of the present invention to provide a portable data storage/audio reproduction apparatus which is capable of storing various information data and transferring or storing the stored information data to other personal computers or storage media.

It is yet another object of the present invention to provide a portable data storage/audio reproduction apparatus which is capable of classifying compression-stored audio data according to lists, visually displaying the classified lists through display means and remotely transmitting the audio data to an audio system by radio to allow the user to listen to music of the audio data from the audio system.

In accordance with the present invention, the above and other objects can be accomplished by a provision of a portable data storage/audio reproduction apparatus comprising a power supply for converting input AC power into a desired level of DC power, rectifying the converted DC power and supplying the rectified DC power to the reproduction apparatus; a key input unit for inputting a plurality of key signals to operate various functions of the reproduction apparatus; a personal computer for downloading and storing audio data and various information data through Internet or PC communication according to a program contained therein; a flash memory having a desired storage capacity for storing the audio data and various information data from the personal computer; a microphone for converting external input voice or sound into an electrical signal; an FM radio receiver for receiving a desired band of FM radio signals through a receiving antenna; a central processing unit for controlling the operations of the key input unit, personal computer and flash memory and performing an arithmetic operation for output data therefrom according to programs contained therein to generate a plurality of control signals; a liquid crystal display for providing a visual indication of output data from the central

processing unit; a digital signal processor for processing input/output digital signals to/from the central processing unit; an audio codec for coding a digital audio signal from the digital signal processor into an analog audio signal, transferring the coded analog audio signal to an audio input/output unit, decoding 5 an analog audio signal from the audio input/output unit into a digital audio signal and transferring the decoded digital audio signal to the digital signal processor; the audio input/output unit receiving an external analog audio signal, transferring it to the audio codec, receiving the analog audio signal from the audio codec and outputting it externally; a radio frequency transmitter for modulating the coded 10 analog audio signal from the audio codec into a radio frequency signal and remotely transmitting the modulated radio frequency signal through a transmitting antenna; and an equalizer for compensating for a distortion of output audio data from the reproduction apparatus.

15 Brief Description of the Drawings

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

20 Fig. 1 is a block diagram of a portable data storage/audio reproduction apparatus in accordance with the present invention; and

Fig. 2 is a detailed circuit diagram of a radio frequency transmitter in

Fig. 1.

Best Mode for Carrying Out the Invention

With reference to Fig. 1, there is shown in block form the construction 5 of a portable data storage/audio reproduction apparatus in accordance with the present invention. In this drawing, the reference numeral 36 denotes a power supply for converting input alternating current (AC) power into a desired level of direct current (DC) power, rectifying the converted DC power and supplying the rectified DC power to the reproduction apparatus. Alternatively, either a 10 general battery or rechargeable battery may be used instead of the power supply 36. The power supply 36 may include a separate adapter for dropping or converting an external voltage or a regulator for outputting a fixed level of stable voltage. It is preferable that the reproduction apparatus receives power from the adapter or battery. The battery generally comprises nickel or other ions. It is 15 preferable that the battery is charged with the power from the adapter.

The reference numeral 10 denotes a key input unit for inputting a plurality of key signals to operate various functions of the present reproduction apparatus. The key input unit 10 includes a recording key for storing audio data in the present reproduction apparatus, a play key for reproducing the audio data stored in the reproduction apparatus, a stop key for stopping the operation of the reproduction apparatus, a volume key for raising or lowering the level of output audio from the reproduction apparatus, a start/end detection key for detecting start and end points of the audio data stored in the reproduction apparatus, a

menu key for displaying all the functions of the reproduction apparatus, an equalizer on/off key for turning on/off the operation of an equalizer 35 for correction of the output sound from the reproduction apparatus, a repeat key for repeating the reproduction of desired data in the reproduction apparatus, a 5 frequency modulation (FM) radio ON key for receiving an FM radio signal, and a radio frequency transmission key for transmitting an audio signal by radio.

The reference numeral 12 denotes a personal computer for downloading audio data compressed using a moving picture experts group 2 (MPEG 2) layer 3 (MP3) technique, which is the international audio compression standard, and 10 various information data through Internet or PC communication according to a program contained therein and storing the downloaded audio data and information data. The personal computer 12 can download various file-unit information data as well as audio data and output the downloaded data to an input/output unit connected thereto.

15 The reference numeral 14 denotes a flash memory having a desired storage capacity for storing the audio data and various information data from the personal computer 12. When the amount of data stored in the flash memory 14 exceeds the desired storage capacity, it is automatically erased in the input order. Preferably, the flash memory 14 may be a random access memory (RAM) or an 20 electrically erasable and programmable read only memory (EEPROM).

The reference numeral 16 denotes a microphone for converting external input voice or sound into an electrical signal.

The reference numeral 18 denotes an FM radio receiver for receiving a

desired band of FM radio signals through a receiving antenna 19.

The reference numeral 20 denotes a central processing unit (CPU) for controlling the operations of the key input unit 10, personal computer 12 and flash memory 14 and performing an arithmetic operation for output data therefrom according to programs contained therein to generate a plurality of control signals. The programs contained in the CPU 20 may be a program for the control of the reproduction apparatus and a program for the storage of input audio data.

The reference numeral 22 denotes a liquid crystal display (LCD) for providing a visual indication of output data from the CPU 20. The LCD 22 may preferably be of a 128x32-dot graphic type. The LCD 22 includes a plurality of icons for visually displaying a charged state of the battery, an operated state of the reproduction apparatus, a key input state of the key input unit 10, a name of an output tune, a list of audio data stored in the reproduction apparatus, etc.

The reference numeral 24 denotes a digital signal processor 24 for processing input/output digital signals to/from the CPU 20. The digital signal processor 24 includes a microprocessor for performing an algebraic operation for digital values to control filtering, modulation/demodulation, spectrum analysis and linear estimation.

The reference numeral 26 denotes an audio codec for coding a digital audio signal from the digital signal processor 24 into an analog audio signal, transferring the coded analog audio signal to an audio input/output unit 28,

decoding an analog audio signal from the audio input/output unit 28 into a digital audio signal and transferring the decoded digital audio signal to the digital signal processor 24. The audio input/output unit 28 is adapted to receive an external analog audio signal, transfer it to the audio codec 26, receive the analog audio 5 signal from the audio codec 26 and output it externally.

The reference numeral 30 denotes a radio frequency transmitter for modulating the coded analog audio signal from the audio codec 26 into a radio frequency signal and remotely transmitting the modulated radio frequency signal through a transmitting antenna 31. The radio frequency transmitter 30 includes, 10 as shown in Fig. 2, a frequency setting/oscillating circuit 40 for setting a desired frequency level and generating a signal oscillating at the set frequency level, a transmission controller 42 for outputting the coded analog audio signal from the audio codec 26 synchronously with the oscillating signal from the frequency setting/oscillating circuit 40, a primary amplifier TR1 for primarily amplifying 15 the audio signal from the transmission controller 42 to a first predetermined level, an oscillator 43 for oscillating an output signal from the primary amplifier TR1, a secondary amplifier TR2 for secondarily amplifying an output signal from the oscillator 43 to a second predetermined level, a tuner 44 for tuning an output signal from the secondary amplifier TR2 to a desired frequency channel, and a 20 gain controller 45 for controlling a transmission gain of the transmitting antenna 31.

The equalizer 35 functions to attenuate a noise component of output audio data from the reproduction apparatus to compensate for a distortion thereof.

An interface 13 is connected between the personal computer 12 and CPU 20 for data interfacing therebetween, and an interface 29 is connected between the audio input/output unit 28 and an audio system 32 for data interfacing therebetween.

5 Now, a detailed description will be given of the operation of the portable data storage/audio reproduction apparatus with the above-mentioned construction in accordance with the present invention.

First, as the user needs, the personal computer 12 downloads and stores 10 audio data, compressed in the form of an MP3 file by a compression technique and uploaded on a homepage, bulletin board or data library, through Internet or PC communication with or without charge. Then, in the present reproduction apparatus, the audio data downloaded by the personal computer 12 is stored in the flash memory 14 via the interface 13 under the control of the CPU 20. Noticeably, only a storage capacity of about 3-4Mbytes is required to store music 15 data with a length of about three minutes in the form of an MP3 file, whereas a storage capacity of about 40Mbytes or more is required to store such music data on a general compact disk.

As a result, the number of storable music files is determined according 20 to the storage capacity of the flash memory 14 and the size of each file. In the present embodiment, music files of about twenty tunes are storable in the flash memory 14. Alternatively, a larger number of music files may be stored in the present reproduction apparatus when a smart card or separate memory means is connected thereto. It is preferable that the flash memory 14 can store an

amount of audio data corresponding to one hour or more.

On the other hand, external input voice or sound from the microphone 16 may be stored in the flash memory 14. That is, the microphone 16 converts the external input voice or sound into an electrical signal, which is then stored in 5 the flash memory 14 under the control of the CPU 20. If the FM radio ON key on the key input unit 10 is operated by the user, then the CPU 20 applies a corresponding control command to the FM radio receiver 18 to receive an FM radio broadcast through the receiving antenna 19. At this time, if the recording key on the key input unit 10 is operated by the user, the FM radio broadcast 10 received by the FM radio receiver 18 is stored in the flash memory 14 under the control of the CPU 20.

Alternatively, audio data about a foreign language from the personal computer 12 or audio system 32 may be stored in the flash memory 14 under the control of the CPU 20, thereby enabling the user to study the foreign language.

15 On the other hand, data with extension indexes such as HWP, BMP, GIF, TXT and DOC, stored in the personal computer 12, may be downloaded and stored in the flash memory 14 under the control of the CPU 20. In this case, the data stored in the flash memory 14 may be transferred and stored to another personal computer.

20 The LCD 22 provides character or numeric indications of all functions of the present reproduction apparatus under the control of the CPU 20. The LCD 22 may preferably be of a 128x32-dot graphic type capable of displaying about twelve characters and two lines at the maximum. For example, the LCD

22 may display a key input state of the key input unit 10 and a control state by the CPU 20. Alternatively, in the case of including separate icons, the LCD 22 may display a charged state of the battery and the current time or function as a calculator or a game machine based on various programs.

5 Further, the LCD 22 can indicate whether a music file stored in the flash memory 14 was written in Korean or a foreign language such as English or Japanese. The LCD 22 may preferably display the contents of the music file stored in the flash memory 14 in Korean or English. For example, in the case where the music file stored in the flash memory 14 was written in Korean or 10 English, the LCD 22 displays a title, lyric lines, a composer or a lyric writer of the music file in Korean or English.

Preferably, the present reproduction apparatus has a tune selection function of displaying tunes of a group, singer or genre desired by the user or user's favorite tunes on the LCD 22. Further, a list of music files stored in the 15 flash memory 14 may be displayed on the LCD 22 in the stored order.

On the other hand, in a compression technique of the present invention, audio and video signals are transmitted at a rate of 1.5Mbits/sec (video: 1.2Mbits/sec and audio: 0.3Mbits/sec). In practice, the amount of audio data on a compact disk, not compressed, is 44.100 sample/sec x 16bits/sec x 2 channel, 20 which is greater than 1.4Mbits/sec. Herein, a monophonic channel is a single audio channel, and stereo channels are not subjected to joint stereo coding.

The equalizer 35 is connected to the CPU 20 to enhance a signal-to-noise ratio of output audio data from the present reproduction apparatus, so as to

restore the quality of output sound therefrom to that on a compact disk without data attenuation. If the play key on the key input unit 10 is operated by the user, then the CPU 20 outputs a music file stored in the flash memory 14 to the digital signal processor 24 for the digital process thereof. The digital signal processor 5 24 includes a microprocessor for performing an algebraic operation for digital values to control filtering, modulation/demodulation, spectrum analysis and linear estimation.

Then, the audio codec 26 codes a digital audio signal from the digital signal processor 24 into an analog audio signal and transfers the coded analog 10 audio signal to the audio input/output unit 28.

The audio input/output unit 28 amplifies the analog audio signal from the audio codec 26 to an audible frequency level and transmits it by wire to the audio system 32 via the interface 29. On the other hand, in the case where the radio frequency transmission key on the key input unit 10 is operated by the user, 15 the radio frequency transmitter 30 modulates the coded analog audio signal from the audio codec 26 into a radio frequency signal and remotely transmits the modulated radio frequency signal through the transmitting antenna 31. Namely, in the radio frequency transmitter 30, the frequency setting/oscillating circuit 40 sets a frequency level to an approved FM frequency of 106.2MHz and generates 20 a signal oscillating at the set frequency level. Then, the transmission controller 42 outputs the coded analog audio signal from the audio codec 26 synchronously with the oscillating signal from the frequency setting/oscillating circuit 40, and the primary amplifier TR1 primarily amplifies the audio signal from the

transmission controller 42 to a first predetermined level. The oscillator 43 oscillates an output signal from the primary amplifier TR1, and the secondary amplifier TR2 secondarily amplifies an output signal from the oscillator 43 to a second predetermined level. Subsequently, the secondarily amplified signal 5 from the secondary amplifier TR2 is transmitted through the tuner 44, gain controller 45 and transmitting antenna 31.

Then, the audio system 32 receives the radio frequency signal from the radio frequency transmitter 30 through a receiving antenna 33, demodulates it into the original audio signal and outputs the demodulated audio signal externally 10 through a speaker 37. Preferably, the audio system 32 may include an FM radio receiver for receiving and demodulating the radio frequency signal from the radio frequency transmitter 30.

Accordingly, the present reproduction apparatus may reproduce a music file stored therein and remotely transmit it to a desired audio system containing 15 an FM radio receiver by wireless as well as by wire.

Further, to the contrary, audio data from a desired audio system may be received by wire or wireless and stored in the flash memory 14 via the audio codec 26 and digital signal processor 24 under the control of the CPU 20. Moreover, the user may listen to sound of a music file stored in the reproduction 20 apparatus using an earphone or headphone.

Preferably, the present reproduction apparatus may employ a run-length coding technique for compressing soundless portions of audio data.

Industrial Applicability

As apparent from the above description, the present invention provides a portable data storage/audio reproduction apparatus which is capable of 5 downloading or receiving and storing MP3 music files, various data files or foreign language data through Internet, PC communication, an FM radio receiver, a microphone or an audio system. Therefore, the user can listen to sound or voice of audio data stored in the reproduction apparatus through an earphone, headphone or speaker while carrying it. Further, the user can listen to the sound 10 or voice of the stored audio data through the audio system by wire or wireless. Moreover, the present reproduction apparatus can download and store music files of a music genre, singer or group desired by the user from an MP3 music file vending machine and automatically erase the stored music files in the stored order or at a time. Further, the user can get a view of the operated state of the 15 reproduction apparatus through a liquid crystal display. Further, the present reproduction apparatus is designed to have such a small size that it can be convenient to carry.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that 20 various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Claims:

1. A portable data storage/audio reproduction apparatus comprising:
 - 5 a power supply for converting input AC power into a desired level of DC power, rectifying the converted DC power and supplying the rectified DC power to said reproduction apparatus;
 - a key input unit for inputting a plurality of key signals to operate various functions of said reproduction apparatus;
- 10 a personal computer for downloading and storing audio data and various information data through Internet or PC communication according to a program contained therein;
 - a flash memory having a desired storage capacity for storing the audio data and various information data from said personal computer;
- 15 a microphone for converting external input voice or sound into an electrical signal;
 - an FM radio receiver for receiving a desired band of FM radio signals through a receiving antenna;
 - a central processing unit for controlling the operations of said key input unit, personal computer and flash memory and performing an arithmetic operation for output data therefrom according to programs contained therein to generate a plurality of control signals;
 - a liquid crystal display for providing a visual indication of output data

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from said central processing unit;

a digital signal processor for processing input/output digital signals to/from said central processing unit;

an audio codec for coding a digital audio signal from said digital signal processor into an analog audio signal, transferring the coded analog audio signal to an audio input/output unit, decoding an analog audio signal from said audio input/output unit into a digital audio signal and transferring the decoded digital audio signal to said digital signal processor;

said audio input/output unit receiving an external analog audio signal, transferring it to said audio codec, receiving the analog audio signal from said audio codec and outputting it externally;

a radio frequency transmitter for modulating the coded analog audio signal from said audio codec into a radio frequency signal and remotely transmitting the modulated radio frequency signal through a transmitting antenna; and

an equalizer for compensating for a distortion of output audio data from said reproduction apparatus.

2. A portable data storage/audio reproduction apparatus as set forth in Claim 1, wherein said key input unit includes:

a recording key for storing audio data in said flash memory;

a play key for reproducing said audio data stored in said flash memory;

a stop key for stopping the operation of said reproduction apparatus;

a volume key for raising or lowering the level of output audio from said reproduction apparatus;

a start/end detection key for detecting start and end points of said audio data stored in said flash memory;

5 a menu key for displaying all the functions of said reproduction apparatus;

an equalizer on/off key for turning on/off the operation of said equalizer;

a repeat key for repeating the reproduction of desired data in said reproduction apparatus;

10 an FM radio ON key for turning on the operation of said FM radio receiver; and

a radio frequency transmission key for turning on the operation of said radio frequency transmitter.

15 3. A portable data storage/audio reproduction apparatus as set forth in Claim 1, wherein said radio frequency transmitter includes:

a frequency setting/oscillating circuit for setting a desired frequency level and generating a signal oscillating at the set frequency level;

20 a transmission controller for outputting the coded analog audio signal from said audio codec synchronously with the oscillating signal from said frequency setting/oscillating circuit;

a primary amplifier for primarily amplifying the audio signal from said transmission controller to a first predetermined level;

an oscillator for oscillating an output signal from said primary amplifier;
a secondary amplifier for secondarily amplifying an output signal from
said oscillator to a second predetermined level;
a tuner for tuning an output signal from said secondary amplifier to a
5 desired frequency channel; and
a gain controller for controlling a transmission gain of said transmitting
antenna.

4. A portable data storage/audio reproduction apparatus as set
forth in Claim 1, further comprising an audio system for receiving said analog
10 audio signal from said audio input/output unit by wire, amplifying it and
outputting the amplified audio signal externally through a speaker or receiving
said radio frequency signal from said radio frequency transmitter by wireless
through a receiving antenna, demodulating it into the original audio signal and
15 outputting the demodulated audio signal externally through said speaker.

5. A portable data storage/audio reproduction apparatus as set
forth in any one of Claim 1 to Claim 4, further comprising:
a first interface connected between said personal computer and central
20 processing unit for data interfacing therebetween; and
a second interface connected between said audio input/output unit and
audio system for data interfacing therebetween.

6. A portable data storage/audio reproduction apparatus as set forth in Claim 1, wherein said power supply includes a general battery or rechargeable battery.

5 7. A portable data storage/audio reproduction apparatus as set forth in Claim 1 or Claim 6, wherein said liquid crystal display is of a 128x32-dot graphic type, said display including a plurality of icons for visually displaying a charged state of said battery, an operated state of said reproduction apparatus, a key input state of said key input unit, a name of an output tune and a
10 list of audio data stored in said flash memory.

8. A portable data storage/audio reproduction apparatus as set forth in Claim 1, wherein said flash memory is a random access memory or an electrically erasable and programmable read only memory which is connectable
15 to a smart card.

1/2

Fig. 1

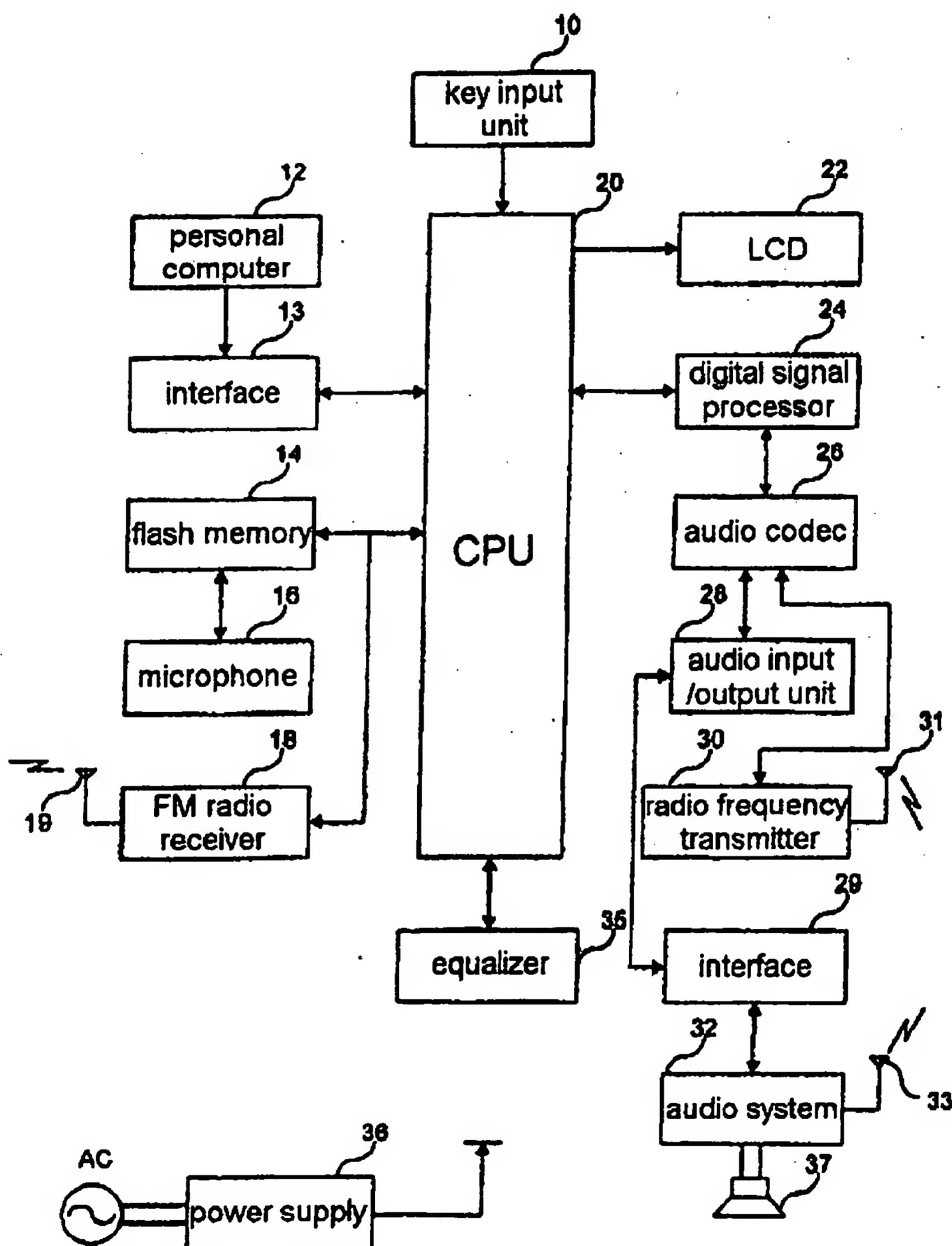
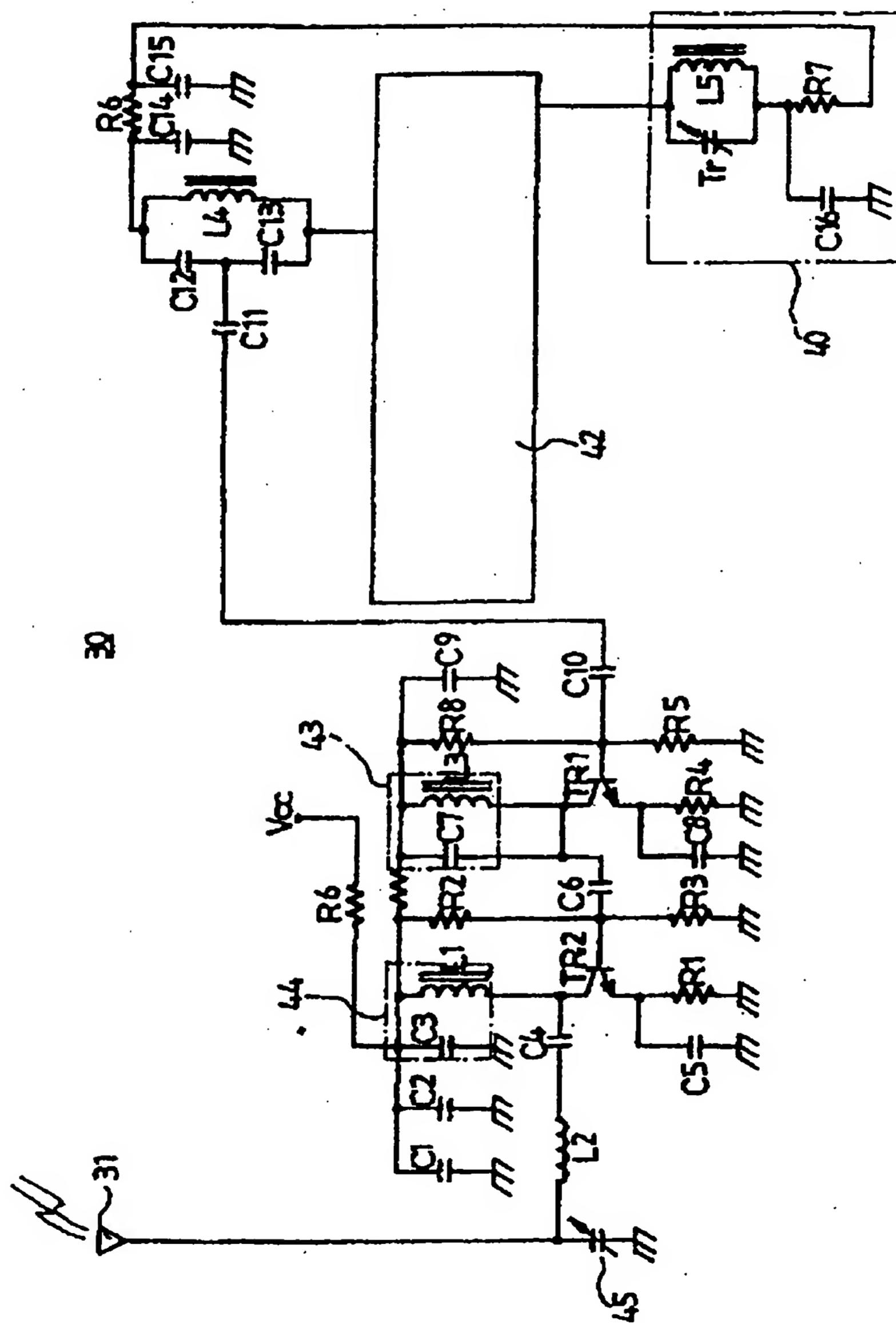


Fig. 2

2/2



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR00/00202

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 G11B 20/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 G11B20/04 H04B7/26 H04L12/58 G11B31/00 H04B1/16 H04B1/20 H04M11/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
KOREAN PATENTS AND APPLICATIONS FOR INVENTIONS SINCE 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPI, PAJ "AUDIO" "DATA" "MEMORY" "TRANSMIT" "DOWNLOAD" "INTERFACE" "REPRODUCE"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,Y	KR 99-78506 (LEE, JANG-KYU) 5 DECEMBER 1999, see the whole document	1-8
P,Y	KR 99-24210 (KIM, JAE-HAN) 25 MARCH 1999, see the whole document	1-8
Y	JP 8315555 (AJWA CORP.) 20 DECEMBER 1996. Claim 2	1, 4, 5
A	JP 9269794 (CANON CORP.) 23 MAY 1990, Claim 1	1, 4, 5

 Further documents are listed in the continuation of Box C. See patent family annex.

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Date of the actual completion of the international search 30 JUNE 2000 (30.06.2000)	Date of mailing of the international search report 10 JULY 2000 (10.07.2000)
Name and mailing address of the ISA/KR Korean Industrial Property Office Government Complex-Taejon, Dunsan-dong, So-ku, Taejon Metropolitan City 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer SEO, Hawthorne Telephone No. 82-42-481-5693

